

ORIGINAL

OPEN MEETING AGENDA ITEM



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BEFORE THE ARIZONA CORPORATION COMMISSION

AZ CORP COMMISSION  
DOCKET CONTROL

COMMISSIONERS

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2012 DEC 24 AM 10 49

Arizona Corporation Commission  
**DOCKETED**

DEC 24 2012

DOCKETED BY

*ZM*

IN THE MATTER OF THE APPLICATION OF  
ARIZONA PUBLIC SERVICE COMPANY  
FOR APPROVAL OF ITS 2013 RENEWABLE  
ENERGY STANDARD IMPLEMENTATION  
FOR RESET OF ITS RENEWABLE ENERGY  
ADJUSTOR.

**DOCKET NOS.**

E-01345A-12- 0290

AND E-01345A-10-0394

**REPLY COMMENTS OF  
THE VOTE SOLAR INITIATIVE**

The Vote Solar Initiative ("Vote Solar") appreciates the opportunity to submit comments to the Arizona Corporation Commission ("Commission") on Arizona Public Service ("APS") 2013 Renewable Energy Standard and Tariff ("REST") Implementation Plan ("Plan"). Our comments respond to both APS's November 15<sup>th</sup> comments (*Comments to Staff's Recommended Opinion and Order*) and to APS's December 6<sup>th</sup> comments, which included a Navigant Consulting report titled, "Net Metering Bill Impacts and Distributed Energy Subsidies."

The Vote Solar Initiative is a non-profit grassroots organization working to foster economic opportunity, promote energy independence and address climate change by making solar a mainstream energy resource across the United States. Since 2002, Vote Solar has engaged at the state, local and federal levels to remove regulatory barriers and implement the key policies needed to bring solar to scale.

Vote Solar is particularly focused on rate design issues related to distributed generation (DG or DE) solar, including the billing arrangement known as net metering. Recognizing the importance of this policy for supporting customer-sited solar and other renewables energy technologies, Vote Solar is actively participating in net metering and broader rate design regulatory proceedings in states across the U.S, including: Arizona, California, Colorado, Minnesota, New Mexico, New York and Vermont among others.

***A. Properly assessing the benefits and costs of net metering***

As a general principle, net metering is one of the most effective policies for supporting customer generation of renewable energy, and is currently enabling customer-sited generation in 43 states and the District of Columbia. The simplicity and understandability of net metering have been pivotal in reducing barriers to consumer uptake of energy technologies such as solar, and is arguably one of most successful market transformation policies for the renewable energy economy. That said, Vote Solar recognizes and appreciates the need to assess the true and realized costs and benefits of offering this public policy. A stakeholder-driven, comprehensive cost and benefit evaluation will help improve rate design to ensure that the following principles are fully considered:

- 1) **Proper valuation of solar electricity, and adequate compensation for solar customers:** Customer-sited solar generation offers many benefits to the electric utility system and by extension to non-solar customers, including but not limited to: reduction in utility energy and capacity generation requirements, particularly during peak periods; reduction in system losses; avoidance or deferral of distribution and transmission investments; localized grid support, including enhanced reliability benefits; fuel-price certainty; and reduction in air emissions and water use. It is essential that the aforementioned benefits be quantified so that solar customers are adequately compensated for the value that their investment in solar energy is delivering to the grid.
- 2) **Non-discriminatory practices within cost of service recovery:** Rates should provide an opportunity for the utility to recover its cost of providing service and earn an adequate return for shareholders, while also avoiding cost shifts among and within customer classes. After accounting for all utility benefits and offsetting cost reductions due to distributed solar, any utility charges created specifically for the purpose of recovering embedded fixed costs from net-metering customers should only recover *net* fixed costs. Similarly, after accounting for all utility costs, any utility credits created for the purpose of assuring that the economic benefits resulting from the deployment of net-metered solar systems are properly assigned back to the net-metering customer(s) should only reflect *net* benefits.

APS, like many utilities around the country that have taken the lead in allowing and even encouraging high solar penetration, rightly seeks to evaluate the net rate impacts (costs and benefits) of net metering. Vote Solar is concerned, however, that APS's comments presuppose the outcome of this evaluation prior to the completion of this process. APS is explicit in their November 15<sup>th</sup> comments that net metering is a subsidy, and that this policy is supported by a cross-subsidy in which non net-metering customers are charged higher electricity rates.

Vote Solar also takes issue with APS statements suggesting that there is consensus around the country that net metering is a subsidy, and that DG solar offers insignificant value to the utility and its system. Based on our extensive engagement in net metering and DG solar evaluations across the U.S., Vote Solar has seen substantial evidence that the increased deployment of DG solar result in significant benefits to the entire electricity rate base. As the results of some of the most prominent DG valuation studies clearly demonstrate, the benefits of DG solar are real and can be quantified (RW Beck's 2009 study for APS, Austin Energy's 2012 solar value study, and Crossborder Energy's 2012 study of net metering in California). Please see Appendix 1, which highlights the components and results of all recent DG cost and benefit studies.

Vote Solar appreciates that each utility service area is unique, and that a proper evaluation process will reveal both benefits and costs resulting from net metering programs and increasing deployment of DG solar. We approach each evaluation process with an open mind, and expect the same from other stakeholders. It is in this respect we remain concerned that the balance of costs and benefits for each customer class has not been fully evaluated in APS's service territory. We are further concerned that APS's strong claim that net metering is a subsidy has not been tempered with a full, proper and unbiased cost and benefit evaluation of net metering and DG solar.

#### ***B. Assessing the benefits of DG solar***

APS was one of the first utilities in the nation to proactively consider this topic when they issued

a Request for Proposal (RFP) for a Distributed Renewable Energy Operating Impacts and Valuation Study in February 2008. RW Beck was chosen to undertake the study, which cost \$750 million, took 1½ years to complete and resulted in a 424-page report.

From the outset, APS and RW Beck established a stakeholder process that was well informed and based upon a rational, open and cooperative foundation on which to calculate value assessments. While APS was rightly a major stakeholder in this process, all stakeholders were provided opportunity for input, and many commended the process. The following paragraph highlights the extensive stakeholder input:

*More than 60 individuals representing 35 companies, universities, trade associations and national laboratories actively participated in the Study process<sup>1</sup>, which included an opening and closing forum and five extensive workshops in which each Task methodology and results were reviewed, discussed and evaluated. In addition to the external stakeholders, APS provided significant input to the Study as a critically important internal stakeholder. APS provided expertise and employee assistance from its Renewable Energy, Energy Delivery, Transmission, Resource Planning, Rates and Regulation divisions, as well as other organizational areas, all of whom were involved from the outset of the Study.*

*....  
Given the critical nature of the stakeholder engagement, participation in the Study took a number of forms including two open forums, five workshops, numerous informal working groups, as well as interaction via the Study web site ([www.solarfuturearizona.com](http://www.solarfuturearizona.com)). The goal was to engage a variety of interested parties in the process during the analysis of the data and the creation of the Study to build a robust, supportable outcome for the longer term.<sup>2</sup>*

Specifically, the Study utilized the following methods to derive economic value from solar DG deployment:

- Quantify the savings from avoided or reduced energy usage costs due to deployment of DG solar, based primarily on reduced fuel and purchased costs.
- Quantify the savings from reduced capital investment costs resulting from deployment of DG solar, including the deferral of capital expenditures for distribution, transmission and generation facilities.
- Estimate the present value of these future energy and capital investment savings due to deployment of DG solar.
- Consider the impacts of various qualitative factors that will impact deployment of DG solar.

The study found that DG deployment would produce between \$0.079 to \$0.141 of value for each kilowatt-hour of DG energy added to APS's grid by 2025, assuming full build-out of the DG requirements within the Renewable Energy Standard. The study found that a large portion of potential annual savings from solar DG generation resulted from avoiding the need for APS to generate an equivalent amount of energy from conventional sources. The study also identified other benefits including the avoided costs associated with fixed operations and maintenance savings, generation savings, and transmission and distribution savings.

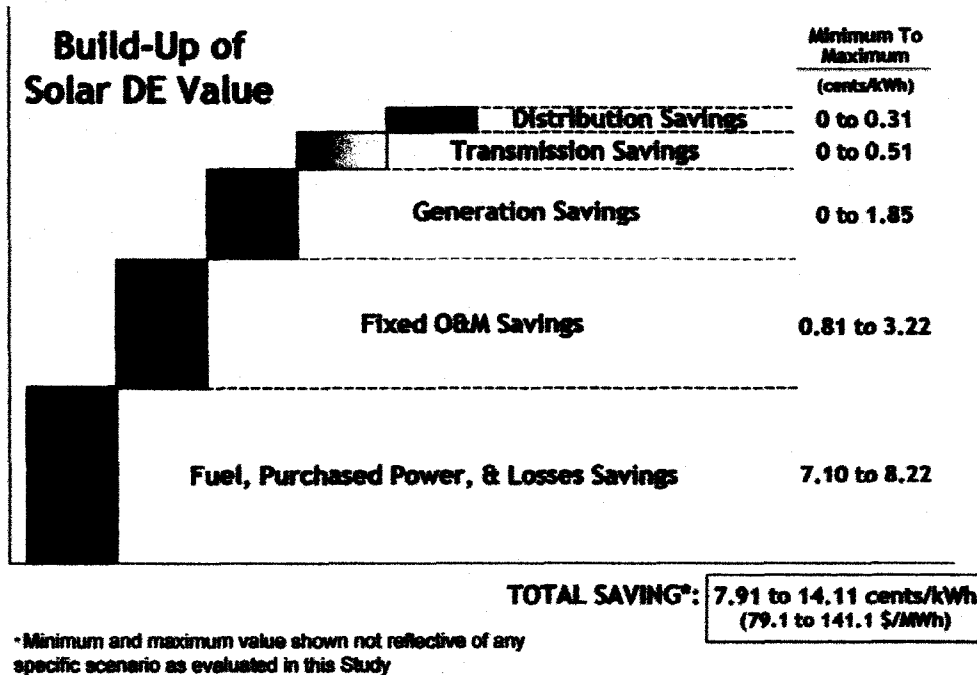
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<sup>1</sup> See Appendix 2 for full list of study participants.

<sup>2</sup> RW Beck. "Distributed Renewable Energy Operating Impacts & Valuation Study." January 2009.

**Chart 1: Valuation of DE Chart from RW Beck's "Distributed Renewable Energy Operating Impacts & Valuation Study"**

**Figure 6-2: Elements of APS's Solar DE Savings in 2025**



We recognize that the benefit value chain in the RW Beck study may require updating to reflect the most recent APS data available. In APS's November 15<sup>th</sup> comments they note that the study "was based upon an early understanding of how DE would impact APS's system." They further highlight two additional areas of concern with the study: 1) the specific solar penetration level studied, and 2) the value of avoided distribution costs. These concerns may be valid and should be studied. Vote Solar believes that it is appropriate to update the underlying RW Beck study to reflect these concerns and suggestions, and to consider other potential concerns from the original stakeholders. Vote Solar's suggests a few areas of improvement in the RW Beck study as well. We would like to see, for example, an assessment of other benefits that were not considered in the original study, including: avoided environmental costs (NOx , SOx , PM, & CO2), avoided RPS generation purchases, and particularly reliability benefits.

The Commission should also be aware that the Solar America Board for Codes and Standards recently released a report entitled, "A Generalized Approach to Assessing the Rate Impacts of Net Energy Metering." The purpose of the report "is to provide a consistent methodology to analyze the potential rate impacts of NEM."<sup>3</sup> See below for a list of costs and benefits the report recommends studying:

<sup>3</sup> Solar America Board for Codes and Standards. "A Generalized Approach to Assessing the Rate Impacts of Net Energy Metering." January 2012.

**Chart 2: Solar ABC's Report List of Costs and Benefits Associated with a Net Metering Program**

<b>Benefits to the Utility</b>	<b>Costs to the Utility</b>
Avoided Energy Purchases (inc/fuel)	NEM Bill Credits
Avoided T&D line losses	Program Administration
Avoided Capacity Purchases	
Avoided T&D Investments and O&M	
Environmental Benefits – NO <sub>x</sub> , SO <sub>x</sub> , PM, & CO <sub>2</sub>	
Natural Gas Market Price Impacts	
Avoided RPS Generation Purchases	
Reliability Benefits	

### ***C. Assessing the Costs of Offering Retail Rate Net Metering***

Vote Solar recognizes that the RW Beck study did not assess the costs to the utility of offering full retail rate for net metering credit. Include costs associated with net metering bill credits and program administration, we believe it is wholly appropriate to update the RW Beck study to include a valuation of these costs. While we strongly encourage this approach, we caution that the “Net Metering Bill Impacts and Distributed Energy Subsidies” study completed by Navigant Consulting is not a substantive and accurate study of the current and projected cost of net metering. Although the Navigant study may prove sufficient to begin the conversation, we are deeply concerned that the analysis does not fully capture the appropriate assumptions necessary, and fails to deliver a comprehensive assessment for analyzing actual costs or benefits.

We are further concerned that APS is submitting this report as a sufficient substitute for a robust and transparent analysis on the actual costs of net metering incurred by APS. We respectfully object if this is the case, and urge the Commission to consider our opinion that the Navigant is in essence a hypothetical case study with unrealistic assumptions, including the size of individual on-site systems.

We offer our critique of the Navigant study below, followed by specific suggestions to ensure that a robust cost and benefit evaluation process is done within APS's service area. By directing a comprehensive and transparent evaluation, the Commission will achieve a greater degree of stakeholder support for the results.

### ***D. Critique of Navigant Consulting Report***

- 1) The report is not based on actual data, but rather presents a hypothetical case study based on unrealistic solar customer profiles**

The study is based on three hypothetical solar customers rather than actual customer data. The three examples presented are problematic and not representative of APS actual solar customers. Thus even as a hypothetical case study, the report is problematic in that it presents an unrealistic, worst-case cost scenario.

The study's 3 hypothetical solar customers were designed in a manner that maximizes the potential cost impact of net metering. Specifically, the analysis assumes that every residential and commercial solar customer would install a solar system large enough to meet 125% or 100%, respectively, of that customer's maximum hourly load. Unfortunately, this is an unreasonable assumption not supported by solar company records of installed systems with APS's service territory. A proper evaluation should instead use a statistically valid set of actual representative residential and commercial system sizes installed in APS territory.

Another concern is that the study models a E-32M medium-size customer instead of a E-32L large-size customer because "APS has more" of those customers. Ultimately, however, what matters most is which class of customers has installed more solar. We are concerned that this exemplifies the types of assumptions utilized in this study that lack logical or reasonable support.

Figures 10 and 11 on page 16 show a hypothetical ET-2 residential customer's monthly consumption versus PV self-generation. Without the underlying data, it is difficult to comment on the reasonableness of these two charts. For example, it appears that in Figure 10 the solar system is generating more than the customer is consuming in April, yet Figure 11 shows 500 kWh delivered by APS to the customer. Thus, it appears that APS continues to supply a significant portion of the customer's electricity for which the customer pays the full retail rate including the fixed costs that are embedded in their particular rate.

**2) While the study primarily focuses on costs, there are some benefits embedded into the case study, of which we are seriously concerned about the value assigned.**

It appears that the only benefits assessed in this hypothetical case study include avoided fuel purchase and capacity benefits. In Table 3 on page 16 and Table 4 on page 19 there is a table entitled: "Subsidy Provided to Hypothetical Residential Solar PV Customer on E-12 Rates." In this table Navigant suggests that on an annual basis there are "\$410 in power production and generation capacity costs", or 'benefits.' There is little explanation given to how this number is calculated, or why other benefits listed in chart 4 below were not calculated. The same holds true for Table 5, on page 23, where the hypothetical commercial customer is shown to have saved APS \$11,539 in annual avoided costs. Without meaningful data, our inference is that the vast majority of benefits calculated in this report are related to reduced fuel purchases.

Capacity benefits, though mentioned, appear to have been assigned little to no value in the Navigant study.

*Although self-generation enables APS to avoid some fixed costs associated with generation capacity, those amounts are relatively small due largely to the limited ability of distributed generation capacity to replace firm dispatchable conventional generation capacity. In particular, APS must maintain enough back-up (i.e., standby) generating capacity to provide the electricity that those customers consume when their systems are not producing electricity (e.g., when clouds obscure the sun, at night or when systems are down). Page 6*

We must respectfully disagree with Navigant's assertion and argue that it is presenting an antiquated load planning perspective. We presume that APS capitalizes on the diversity of load and generation in its operations. For example, we suspect that APS does not run all of its generation each morning on the chance that every air conditioner in its service territory is switched on at the same moment. The advantages of load diversity are equally applicable for geographic solar diversity. For instance, clouds do not necessarily obscure the sun above each and every solar system on APS's grid simultaneously. Vote Solar strongly challenges whether DG

solar has little or no capacity value for the utility, and requests that a robust Effective Load Carrying Capacity study (ELCC) be completed before even considering the unsubstantiated claim that DG solar provides little to no capacity value.

In fact, in APS's 2012 Integrated Resource Plan, on pg. 258, the utility notes that thin film solar PV has a 50% capacity value (note that crystalline silicon solar PV is not included in the capacity value chart).<sup>4</sup> Also, a National Renewable Energy Laboratory report<sup>5</sup>, which reviewed effective load carrying capability (ELCC) for solar technologies by state, showed high capacity values for DG solar in Arizona. The report is now several years old, but the methodology for calculating the ELCC has not changed significantly since the report was released.

**Chart 3. ELCC results for Arizona in NREL Report**

Installation Geometry	Capacity Value at 2% Penetration	Capacity Value at 5% Penetration
PV -Horizontal	55%	52%
PV - Southwest 30° tilt	65%	61%

This chart indicates in all cases that at least half of the solar capacity installed can reliably contribute to the capacity needed by the utilities to serve peak loads. This significant value for solar resources is provided to the grid by virtue of the installations and all customers will receive these benefits over time as they impact the resource planning of the utility.

The Navigant report suggests that DG solar provides no benefits to the system in regards to reliability or ancillary services. The study states, "self-generation by DE customers also does not enable APS to avoid the cost of providing ancillary services needed to maintain the stability of the grid." Again, there is no analysis provided to support this claim.

When compared to the Solar ABC's chart of benefits that should be studied in a net metering cost and benefit analysis, the Navigant Report falls woefully short of adequately considering the suite of potential benefits.

**Chart 4: Benefits and Costs Studied in the Navigant Consulting Report**

Benefits to the Utility	Navigant Report Analysis
Avoided Energy Purchases (inc/fuel)	Included. Navigant refers to this as "additional variable energy costs" on pg. 24
Avoided T&D line losses	No consideration of benefits
Avoided Capacity Purchases	Little to no value assigned to capacity benefits. "Although self-generation enables APS to avoid some fixed costs associated with generation capacity, those amounts are relatively small due largely to the limited ability of distributed generation capacity to replace firm dispatchable

<sup>4</sup> Arizona Public Service. 2012 Integrated Resource Plan. Attachment D-3. Pg.258

<sup>5</sup> Perez, Margolis, et al., *Update: Effective Load-Carrying Capability of Photovoltaics in the United States*, Conference Paper NREL/CP-620-40068, June, 2006.

	<p>APS must maintain enough back-up (i.e., standby) generating capacity to provide the electricity that those customers consume when their systems are not producing electricity” pg. 6</p> <p>Later in the report on pg. 24 Navigant states that “some generation capacity costs” are offset, but does not include analysis to support this statement.</p>
Avoided T&D Investments and O&M	No consideration of benefits
Environmental Benefits – NO <sub>x</sub> , SO <sub>x</sub> , PM, & CO <sub>2</sub>	No consideration of benefits
Natural Gas Market Price Impacts	No consideration of benefits
Avoided RPS Generation Purchases	No consideration of benefits
Ancillary Services/Reliability Benefits	No value assigned to this set of benefits. “Self-generation by DE customers also does not enable APS to avoid the cost of providing ancillary services needed to maintain the stability of the grid.” pg. 6

<b>Costs to the Utility</b>	
NEM Bill Credits	Rather than costing out net metering bill credits, Navigant utilizes a hypothetical annual bill with solar, and takes bill reductions equaling avoided costs (energy plus some minimal value for capacity benefits) MINUS the difference between the bill without and then with solar. See pgs. 17, 19, and 23
Program Administration	No accounting of this cost

### 3) The study overstates the cost impact of commercial customers

The report claims that the “subsidy is lower for medium and large businesses,” on a two-part rate. On page 23, the hypothetical commercial customers ‘cross-subsidy’ represents 12% of an original annual bill without solar. According to the data provided by APS in Appendix A, Table 10, we calculate that on average this hypothetical commercial customer using solar would only be able to reduce their demand charges by 9% over the course of a year. Thus if fixed costs are recovered through demand charges for commercial customers, it is unclear to us how these customers, who tend to not export power back to the grid when using solar, are causing a cross-subsidy, as claimed by the Navigant report.

### 4) The study fails to recognize that potential cost impacts of net metering are the result of underlying electric rate design, rather than resulting from net metering itself. We are concerned that the implications of rate design are largely ignored.

The underlying structure of electric rate tariffs has a significant effect on the costs on net metering credits. APS’s November 15<sup>th</sup> comments, and the subsequent Navigant report do not discuss this fundamental dynamic. If there are overall costs of net metering, especially associated with the residential customer classes, we posit that those costs can be reduced or eliminated through modifying residential rate design to more closely align APS’s retail electric rates with the utility’s cost of service for residential customers. Residential rate design changes such as the



increased use of time-of-use (TOU) rates will ensure that net metering remains cost-effective for residential ratepayers as a whole even as the penetration of PV systems increases.

We are also concerned that the 'Lost Fixed Cost Recovery Adjustor' is not sufficiently considered. The report claims that the LFCRA currently recovers "some, but not all" of the fixed costs not recovered due to PV generation customers. Again, there is little data provided to make an informed judgment on this claim. For example, if not all, what is 'left over'? Greater discussion about this approved cost recovery mechanism is needed.

#### ***E. Suggested Path Forward***

Along with APS, Vote Solar believes that the conversation about the rate impacts of net metering is prudent and "poised to resume." In fact, this is likely the most important conversation related to DG solar that will take place before the Commission in 2013. We are concerned, however, that an APS-convened multi-session technical workshop process will provide a productive, transparent and participatory process to sufficiently address such an important issue. Moreover, given the predisposition of the utility in regards to the outcome of an analysis on the costs and benefits of DG solar and net metering, we urge the Commission to direct an alternative process. Given our experience participating in a variety of forums convened in multiple states to assess the costs and benefits of net metering, we strongly recommend the following process:

1. **ACC Oversight:** We strongly believe the Commission should convene a stakeholder forum rather than APS. While we understand the resource constraints at the Commission, we believe that the Commission has appropriate authority to require that this study is ratepayer funded, consistent with the APS proposal. Given the importance of this evaluation, we recommend that the Commission consider broadening the study to include Tucson Electric Power.
2. **Independent Consultant:** The Commission should choose a 3<sup>rd</sup> party consultant to undertake the task of updating the 2009 RW Beck study in order to include a full and proper evaluation of benefits and costs as outlined in the Solar ABC study. To ensure efficiency and stakeholder acceptance, we urge the Commission to retain SAIC (formerly RW Beck) to manage this process, particularly given their extensive institutional knowledge of the 2009 valuation study and proven track record of including and balancing stakeholder input. However, other consultants could be considered as well including Crossborder Energy, Clean Power Research, and E3, all of which have experience with this type of evaluation effort. We are confident that a Commission requirement to update the 2009 RW Beck study within six months to a year is appropriate and realistic.
3. **Access to Data:** Regardless of the consultant, data from the utility, including system load profile data, and statistically significant representative samples of hourly load profiles must be made available to stakeholders. Data on distribution substations that serve a representative sample of residential, commercial and industrial customers is especially critical in this regard. Access to this data is fundamental for a successful process and respected outcome.
4. **Meaningful Stakeholder Engagement:** We recommend that the Commission should reconvene the 2009 study stakeholder group. Vote Solar, like many of the groups in the original study stakeholder group, strongly desire to reengage such a process. See Appendix 2 for a list of participants in the original stakeholder group.


5. **Technical Workshop Schedule:** We propose the following stakeholder schedule to accommodate travel from outside of Phoenix or Arizona: a full-day in-person workshop once per month (four times, beginning in February), with two hour conference calls in between each in-person meeting (three times).
6. **Scope and Methodology:** The stakeholder group should determine the scope and methodology of the study during the first meeting.
7. **Future Rate Design Changes:** When the updated study is completed, the Commission should open a docket to determine if net metering rules require updating. We strongly suggest against opening such a docket prior to the completion of an updated study.

Currently both California (CPUC Decision 12-05-036) and Vermont (PSC working group stemming from H.475 (Act 0125)) are undertaking similar PUC run, 3<sup>rd</sup> party consultant driven, stakeholder inclusive, cost and benefit evaluations of net metering. We encourage the Commission to reach out to these two Commissions to learn more about their robust processes. The California scope of work for their net metering evaluation process is posted here: [http://www.cpuc.ca.gov/PUC/energy/Solar/nem\\_cost\\_benefit\\_evaluation.htm](http://www.cpuc.ca.gov/PUC/energy/Solar/nem_cost_benefit_evaluation.htm). The Vermont scope of work for their net metering evaluation process is posted here: [http://publicservicedept.vermont.gov/topics/renewable\\_energy/net\\_metering](http://publicservicedept.vermont.gov/topics/renewable_energy/net_metering).

#### ***F. Conclusion***

We look forward to further engaging this important discussion, and always remain available to answer questions from the Commission regarding our written comments. We are hopeful that this process results in a near term proposal that will satisfy stakeholder needs, while simultaneously supporting Arizona's growing DG solar market that is meeting constituents' needs, and creating quality jobs in Arizona. Vote Solar sincerely thanks the Commission for the opportunity to present our perspective. We look forward to working with the Commission and other stakeholders, especially APS, in assessing the true costs and benefits of incorporating net metered solar into the APS system.

Respectfully submitted this 20<sup>th</sup> day of December 2012 by:

  
Annie Lappé  
Solar policy Director  
The Vote Solar Initiative  
1120 Pearl Street, Suite 200  
Boulder, CO 80304  
[annie@votesolar.org](mailto:annie@votesolar.org)

Original and 13 copies filed with Docket Control, Arizona Corporation Commission, 1200 W. Washington St., Phoenix, AZ

# Appendix I

DE Valuation Studies														
Study	Test specifice	Generation analyzed (gross output or exported energy only)	Costs Analyzed		Benefits Analyzed								Calculation of net cost to non- participants	Study Result
			Net metering bill credits	Program admin costs	Avoided energy purchases	Avoided capacity purchases	Avoided T&D line losses	Avoided T&D investments/O &M	Enviro benefits	Natural gas price hedge	Avoided d RPS purchases as	Ancillary services and VAR support		
Solar ABCs 2012 (generalized methodolog y)	Utility/non- participating ratepayers	Exported energy only	X	X	X	X	X	X	X	X	X	X	N/A	N/A
E3 (for CA CPUC, 2010)	Utility/non- participating ratepayers	Exported energy only	X	X	X	X	X	X	X	X	X	X	Yes	The report estimates that the average net cost of NEM is \$0.12 per kWh-exported. The report estimates that on a lifecycle basis, all PV generation on NEM tariffs (\$86/MW installed through 2008) will result in a net present value cost to ratepayers of approximately \$230M over the next 20 years, or approximately \$20M per year on an annualized basis. The total net cost of NEM is less than one-tenth of one percent of total utility revenue. NEM as a policy is one small part of the utility's demand side efforts, which overall represent 7% of the average residential bill and provide a net savings to ratepayers. Note, an updated E3 study will be released in January or February 2013.



APS (R.W. Beck, 2008)	Utility/non-participating ratepayers	Gross output	N/A	N/A	X	X	X	X					X	Did not calculate	The conclusion of the study was that DE deployment produces between \$0.079 to \$0.0141 of value for each kilowatt-hour of DE energy added to APS's grid. Much of the potential annual saving from solar DE production resulted from APS avoiding the need to produce that same energy from conventional sources. Other benefits, or value segments studied included the avoided costs associated with fixed operation and maintenance savings, generation savings, and transmission and distribution savings.
NV Energy (Navagant Consulting, 2010)	Utility/non-participating ratepayers	Economic impact of DG on NV Energy's system and its ratepayers.			Attempted to calculate	Attempted to calculate	Attempted to calculate	Did not calculate	Attempted to calculate	Did not calculate	Did not calculate	Did not calculate	Did not calculate	Did not calculate	Navagant's study focused on evaluating the technical and economic impacts of DG on NV Energy's system and its ratepayers. This study does not address the cost, economics or value of DG from the DG owner's perspective. Net Cost to NV Energy/Ratepayers was estimated to be \$75/MWh in 2011, \$121/MWh in 2015, and \$141/MWh in 2020.
Perez (for NYC area, 2011)	Utility/non-participating AND state/socket	Gross output	N/A		X	X	X	X	X	X			X	Did not calculate	Results for the state of New York suggest that solar electric installations deliver between 15 to 40 cents per kWh to ratepayers and taxpayers.

Peres (for NY and PA, 2012)	Utility/non-participating ratepayers AND state/society	Gross output	N/A	N/A	X	X	X	X	X			X	Calculated additional cost incurred to accept variable solar generation onto the grid.	The study found that solar power delivers a total levelized value ranging from \$256 to \$328 per MWh (25.6 cents to 31.8 cents per kWh). However, this includes a value for Economic Development Value (averaging \$44 per MWh).
NYSEDA/ NYSDS (2012)	Utility/non-participating ratepayers	Gross output	N/A	N/A	X	X	X	X	X		X	N/A		The Low Cost scenario had a net benefit while the High Cost scenario had a net cost four times as high as the Base Case. In the Base Case, achieving a 5,000 MW goal would have a ratepayer impact of \$3 billion over the study period (2013 – 2049), which would equal on average a 1% impact on ratepayer electric bills. In any given year, this rate impact could be as much as 3%. The ratepayer impact under the Low Cost scenario would be approximately \$300 million, whereas the impact under the High Cost scenario would be \$9 billion.

## Appendix 2

### RW Beck Study Stakeholders

- American Solar Electric Inc.
- Arizona Corporation Commission
- Arizona Department of Commerce
- Arizona State University Research
- Park
- Arizona State University School of Global Management
- Desert Sun Solar
- DMB Associates
- El Dorado Holdings
- Electric Power Research Institute
- IREC
- Keyes & Fox, LLP
- Kyocera
- Lawrence Berkeley National
- Laboratory
- Lennar Homes
- National Renewable Energy
- Laboratory (NREL)
- Natural Lighting Company
- Newland Communities
- Pederson Inc.
- Pulte Homes
- Solar City
- Solar Electric Power
- Salt River Project
- Sun Earth Inc.
- Sun Systems Inc.
- Sunbelt Holdings
- SunEdison
- The Vote Solar Initiative
- Tucson City
- Tucson Electric Power
- Venture Catalyst
- University of Arizona
- ViaSol Energy Solutions
- Western Resource Advocates